

Women's perceptions of iron deficiency and anemia prevention and control in eight developing countries

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Abstract: Women's perception of iron deficiency and anemia prevention and control in eight developing countries

In spite of the fact that most ministries of health in developing countries have policies to provide pregnant women with iron in a supplement form, maternal anemia prevalence has not declined significantly where large-scale programs have been evaluated. The World Health Organization estimates that 52% of all pregnant women are anemic. During the period 1991-1998, the MotherCare Project and its partners conducted qualitative research to determine the major barriers and facilitators of iron supplementation programs for pregnant women in eight developing countries. Research results were used to develop pilot program strategies and interventions to reduce maternal anemia.

While women frequently recognize signs and symptoms of anemia, they often do not consider it to be a priority health concern that requires action. Those women who access prenatal health services are often familiar with iron supplements, but commonly do not know why they are prescribed. Contrary to the belief that women stop taking iron tablets mainly due to side effects, only about one-third of women reported that they had experienced negative side effects in these studies. During iron supplementation trials in 5 of the countries, only about one-tenth of the women stopped taking the tablets due to side effects. The major barrier to effective supplementation programs is inadequate supplies. Additional barriers include deficient counseling and distribution of iron tablets, difficult access and poor utilization of prenatal health care services, and cultural beliefs against

consumption of medications during pregnancy. Facilitators include women's recognition of improved physical well being with the alleviation of symptoms of anemia, increased appreciation of benefits for the fetus, and subsequent increased demand for prevention and treatment of iron deficiency and anemia.

Keywords: anemia, compliance, iron, maternal nutrition, supplementation, and pregnancy

Introduction

Iron deficiency anemia affects over 2 billion people worldwide. The World Health Organization estimates that 52% of all pregnant women are anemic (WHO 2000). For women, the consequences of anemia include reduced energy and capacity for work (Basta et al. 1979; Levin 1986), poor pregnancy and birth outcomes including premature delivery, low birth weight, and increased perinatal mortality (Murphy et al. 1986; Scholl et al. 1994), and increased risk of death during delivery and postpartum (Llewellyn-Jones 1965; Ojo and Savage 1974; Zucker et al. 1994; Sarin 1995). It is estimated that as many as 20% of maternal deaths are caused by anemia and that anemia may be an associated cause in as many as 50% of maternal deaths worldwide (Gillespie et al. 1991).

Most Ministries of Health in developing countries have policies to give pregnant women either iron by itself or combined with folate in tablet form or in prenatal vitamins¹. For example, national protocols in India require the provision of 100 tablets containing 100 mg elemental iron and 0.5 mg folic acid for daily consumption to all women during pregnancy and lactation. The Government of Indonesia provides 50 to 60% of the total iron supplements necessary to cover all pregnant and lactating women with daily iron for 130 days (90 during pregnancy and 40 during the postpartum period). Despite these policies, anemia prevalence has not declined significantly where large-scale programs have been evaluated (Gillespie 1991). Many nutrition experts believe that one of the main reasons national iron supplementation programs have failed is women's “non-compliance/non-adherence”² with the daily regimen of iron supplements because of gastrointestinal upset and other side effects that sometimes occur when taking iron

(DeMaeyer 1989). Recent reviews on the topic suggest, however, that there are a number of reasons for ineffective programs including sporadic or poor quality supplies, inadequate delivery and distribution systems, poorly trained and uncommitted health providers, ineffective communication materials to promote behavior change, lack of access to or use of antenatal care, and poor monitoring of the problem. (Gillespie et al. 1991; Galloway and McGuire 1994; Yip 1996).

To investigate factors that influence women's decisions to take iron supplements and suggest ways to improve existing programs, The MotherCare Project³ supported formative research on this subject in eight countries (Bolivia, Burkina Faso, Guatemala, Honduras, India, Indonesia, Malawi, and Pakistan). In most cases, the research was subsequently used to improve the iron supplementation component of antenatal care in on-going MotherCare programs.

Methods

During the period 1991-1998, MotherCare and its partners⁴ conducted qualitative research to determine major barriers and facilitators of iron supplementation programs for pregnant women in developing countries. Both pregnant and non-pregnant women participated in the studies. The research examined knowledge, attitudes, and practices regarding maternal anemia and its symptoms, including causes and consequences of anemia, treatments for anemia, and experience with taking iron tablets as the primary intervention. In the majority of the countries, the studies were "formative" in that they were used to develop program strategies and interventions to reduce maternal anemia.

Sampling

Study respondents were selected to represent the spectrum of different groups within a target population related to age, socioeconomic status or class, ethnicity and culture, and location (e.g., rural and urban). For a more detailed description of the study populations and sampling methods, see Table 1. Study site locations within each country were limited to health areas or districts where MotherCare and its partners were working.

Data Collection

In all countries, data were collected using a variety of methods. Among these were focus group discussions, in-depth interviews, semi-structured and structured interviews, structured questionnaires, and/or direct observations. In India, methods also included free listing of common illnesses and symptoms of pregnant women and ranking these illnesses according to their perceived severity, Venn diagrams, social mapping, case studies, and seasonality analysis. In Bolivia, researchers took an inventory of both pharmaceuticals and traditional medications and treatments in the homes of women who participated in interviews.

Iron supplementation trials using a method known as “Trials of Improved Practices⁵” (TIPs) were carried out in Bolivia, Guatemala, Honduras, West Java, Indonesia, Malawi, and Pakistan (not reported here). Women not familiar with taking iron supplements were given iron folate tablets, counseled on how to take them, and interviewed about their experience 10 to 20 days later. Participants were asked about the

presentation of the tablets (i.e., packaging, color of tablets), side effects, how successful they were in remembering to take the tablets, the perceived benefits, their ability to purchase iron, and their willingness to continue taking iron tablets during pregnancy.

Table 2 summarizes the details of the TIPs for each country.

All research instruments were pre-tested and revised, based on the results of the pretests. Interviewers received training on interviewing techniques and information regarding anemia and iron supplementation. Interviews were conducted and transcribed in local languages and then translated. In some cases, interview transcripts were translated from the indigenous language into French (Burkina Faso) or Spanish (Bolivia and Guatemala), before they were translated into English.

Data Analysis

A variety of software packages were used for data analysis including Gofer, Anthropak, and EpiInfo. In some cases, analysis was conducted by hand.

Results

Anemia and its symptoms

In most countries, anemia is widely recognized by its symptoms rather than by a specific clinical name or as a specific disease⁶. The typical descriptions of anemia include headache, dizziness, paleness, “become yellow,” “decayed blood,” “thin blood,” fainting, “low blood,” weight loss, and loss of appetite (“They eat like cats, very little”[Bolivia]). Women with these symptoms “no longer have any blood,” have “weak

blood” (Guatemala), or “their blood is pure water” (Guatemala, India). Only in Honduras did respondents use the clinical term “anemia.” “We all have one-sixteenth (a Honduran expression meaning “a little”) of anemia but some people have more severe (“deep”) anemia which penetrates the bones and is hard to cure.”

There is evidence of confusion caused by the concept of anemia as “not enough blood” and “low blood” or low blood pressure in Indonesia among some health providers as well as their clients. In addition, the consumption of iron supplements is sometimes understood to “increase the blood” and therefore is associated with hypertensive disorders. A variant of this misconception in South India and Malawi emerged from interviews with women and traditional birth attendants (TBAs). Because iron supplements “increase blood,” some women believe that they will bleed more profusely during delivery if they consume iron during pregnancy.

Causes and consequences of anemia

Across the countries studied, symptoms of anemia are consistently attributed to a poor quality diet and lack of food due to poverty. Women in India specifically mention dietary restrictions and “eating last” or “eating whatever is leftover” as reasons for their inadequate diet. In Pakistan, lack of available meat in some rural areas and competition for limited amounts of iron-rich foods with husbands and children within a household were cited as constraints to dietary sources of bioavailable iron and causes of anemia. In South Kalimantan, Indonesia, not eating nutritious foods, not eating green vegetables and having to work hard are believed by some women to cause anemia. Anemia is linked to sleeping too much (Honduras), or sleeping uncovered and sleeping during the day

(Bolivia). Many study participants in all countries mention that hard work or working in the sun can cause anemia. “In my opinion it (*djoliban*) is due to work. Women work too much, and under the sun. The sun saps physical strength and drinks the blood (Burkina Faso).” Among some individuals in Malawi, water loss through hard work (sweating) and diarrhea are believed to cause a lack of blood, and fevers and eating lemons are thought to “dry up the blood.” Additional causes mentioned include frequent births, malaria, HIV/AIDS, worms, germs in the blood or food, eating dirt and soap, heavy menstrual bleeding, young age, and pregnancy.

Across the studies, approximately half of women participants are aware of possible negative outcomes of anemia for either mother or baby, but results vary widely by individual country. Respondents in Bolivia, Guatemala, and Honduras recognize that the consequences of anemia are serious and that anemia can be fatal for both the mother and baby. In many countries, women think that anemia can be “passed” from the mother to the baby causing the baby to be born too thin, weak, deformed, premature, or sick. Women also believe they may have difficulty giving birth due to a lack of blood or not having enough force or energy at the time of delivery. In Burkina Faso, blood is considered the essence of life, so a lack of blood is serious and potentially fatal. “If you don’t have (enough) blood in your body, your life is in danger. But an excess of blood is harmful, as is poor quality blood.”

Although women in India recognize that anemia can be serious enough to require a blood transfusion, weakness and fatigue are considered normal during pregnancy. At both sites in Indonesia, respondents do not think that anemia is dangerous or a serious

health problem. Recognition of maternal complications associated with anemia (for example, increased risk of mortality due to hemorrhage) appears to be low, with alarmingly passive acceptance of significant blood loss related to labor and delivery, particularly in the study in West Java.

Treatments for anemia

Flowing from their understanding of the dietary etiology of anemia, respondents in all the countries recommend good diet or nutritious food as treatments for anemia. In some cases (for example, in Honduras), both diet and vitamins or medication (e.g., tonics or syrups) are mentioned as treatments. Women state that economic constraints to dietary improvement are the primary barrier to a food-based approach to alleviating signs and symptoms of anemia.

Respondents in Burkina Faso prefer Western medicine (tablets or transfusions) to traditional treatments with plant extracts. In Guatemala, most women feel that the treatment for weakness or *debilidad* is diet or taking/injecting vitamins. Herbs, radish leaves, beets and carrots are all mentioned as cures. These “increase the blood,” “nourish the blood,” and “give energy and force to the blood.” For some respondents, rest is a cure for weakness and lack of blood, but for many women reducing their workload is not possible. Numerous homemade remedies in Honduras also use roots, herbs, and other plants. In most countries, because healthy blood is perceived as red, many of the traditional cures are red.

Because weakness is perceived to be normal during pregnancy, the majority of respondents in India do not seek treatment for anemia unless symptoms become severe.

“When the illness increased and I was not able to get up, then I went to a doctor in the village.” Others mention that poverty keeps them from seeking outside care, and in some cases their husbands or other family members discourage them from going to the clinic. “When I inform my husband about the problem, it goes into one ear and out the other; he says this problem will be all right on its own.”

In West Java, where some pregnant women attribute symptoms of anemia to black magic or a curse, religious leaders, a Shaman, or a soothsayer are consulted for treatment. In South Kalimantan, Indonesia women generally do not know how to treat anemia, but some suggest that improving the diet will be helpful. About one-quarter of women interviewed state that anemia can be prevented by taking iron pills.

For respondents in Malawi, the cure for severe anemia is a blood transfusion. Foods such as vegetables, tomatoes, meat, and eggs can cure less severe anemia. The practice of providing Coca-Cola® to blood donors has led to a widespread belief that Coke® is a cure for “low blood.” Iron tablets are understood to cure anemia, but not to prevent the condition.

Knowledge and use of iron supplements

In most of the countries studied, women attending prenatal care services recognize iron tablets or prenatal vitamins and may take them as instructed, but are not told why they are prescribed. In Bolivia, women who receive prenatal care are familiar with iron tablets, but few of them understand that they will alleviate signs and symptoms of anemia. Women in Honduras who attend antenatal care are given prenatal vitamins but only receive iron if they are thought to be anemic.

Most women attending prenatal care do so only in their late second or third trimesters, making it impossible for them to receive the recommended number of iron tablets in pregnancy (protocols range from 90-150 tablets in the countries surveyed). The majority of women who have taken iron tablets identify positive effects and benefits from taking them, including having more strength and more or improved blood, feeling less tired and more active, and for some, having a healthy baby. “I used to feel weak. After taking these iron capsules, I feel better and I can go about my daily routine well. I feel that due to the medicine I am able to do my household chores as usual” (Pakistan). A mother-in-law in Pakistan reflected that, “One benefit of iron tablets is that my daughter-in-law used to have abortions; after taking these tablets she stayed pregnant.” The major reasons women do not continue taking iron tablets are poor access to supplies (i.e., low utilization of antenatal care services or inadequate supplies at facilities), the form of the tablet (i.e., unappealing taste, smell, or color), side effects (e.g., gastrointestinal problems), fear (e.g., high birthweight, difficult delivery, harm to the fetus), recovery (i.e., feel better so no longer need the tablets) and behavior (i.e., forgetting or not wanting to take the tablets).

Honduras is the one site where taking iron during pregnancy is associated with cavities or spots on babies’ teeth and face spots on mothers. A disinclination to take medicine (i.e., pills) during pregnancy makes some women in Bolivia reluctant to consume iron supplements. They prefer herbal preparations and tonics. From the survey of medications in households, thirteen of the nineteen remedies found in homes are plants, herbs, and tonics women use to treat anemia or weakness.

Respondents in Malawi complain that only those diagnosed with anemia are given iron tablets. An inadequate supply of iron supplements appears to be a serious problem at the national level in Malawi; no women in the study received adequate amounts of iron from any source, including medical assistants, nurses, or TBAs. One tea estate medical officer explained that their policy was to emphasize good nutrition because they did not want to encourage women to become dependent on iron tablets that are in short supply. Yet limited household resources make following the dietary advice impossible for most women.

Distribution channels

In the Latin American countries surveyed, women are reluctant to accept iron tablets from sources outside the government health system, fearing poor quality control and lack of medical supervision. In South India, where the private sector is well developed at the community level, the opposite case is true, with women suspicious of the quality of government-supplied pharmaceuticals. There, tablets procured and distributed through NGOs, purchased from private clinics, or in the marketplace are regarded as preferable. Women and their families echoed this sentiment in Pakistan, where many prefer to purchase iron supplements at a chemist after receiving a prescription from a health service provider. In West Java, Indonesia, research findings showed that there was skepticism among women about expanding community-based distribution networks, but also agreement that a government-sanctioned program to use traditional birth attendants as conduits for iron supplements would be acceptable.

Trials of Improved Practices (TIPs)

Beneficial results of iron supplementation over a period of 10 to 30 days were expressed by participants in all five of the countries in which TIPs were conducted (Bolivia, Guatemala, Honduras, West Java, Indonesia, and Malawi). “Everyday I feel better; I feel like doing everything” (Bolivia). “Now I am eating better and I have gained a little weight” (Bolivia). “Now I feel stronger; before I was exhausted” (Honduras). “These iron tablets give strength...we can work more” (India). “Dizziness stops by taking these tablets” (India). In spite of a range of negative effects experienced by some women (approximately one-third) in each study site (e.g., poor quality of the tablets, including bad taste and a tendency to split or burst, heartburn, headache, dark stools, constipation, and diarrhea), the majority of women persisted with the trial, finding that side effects subsided after the first few days. Only about one-tenth of women stopped taking iron tablets because of side effects. The knowledge that iron will improve the health of their children and themselves motivates most women to tolerate transitory discomforts associated with the iron supplements. Detailed results of the TIPs are found in Table 2.

Problems encountered during the TIPs included intentional overdosing leading to increased side effects (two women in Honduras consumed three tablets a day to achieve more rapid impact despite counseling about the recommended once daily dosage), memory lapses (forgetting to take supplements was noted in Honduras and Indonesia), sharing iron tablets with children, friends, and other family members (Malawi, Guatemala), concern about causing a large baby (one woman in Honduras), and rumors from neighbors about substitution of contraceptives for the iron (Malawi). These

problems surfaced among only a minority of the women and had little impact on their participation in the trial. For example, all 23 women in the Honduras TIPs stated that they would continue to consume iron supplements, and would purchase them as needed.

Discussion

This paper reports on formative research with women designed to determine the barriers and facilitators to existing iron supplementation programs in eight countries. In all countries, most women recognize signs and symptoms of anemia and have a local term(s) for these conditions, but it is not widely considered to be a priority health concern that requires action. In many of the study sites, women consider weakness and dizziness to be normal conditions of pregnancy. Only half of the women surveyed could identify negative consequences of the condition, and these were usually associated with low energy and weakness in the mother. Yet iron supplementation trials demonstrate a basic, but often overlooked or discounted phenomenon. When presented with high quality iron supplements (i.e., acceptable color, taste, coating, size), information about the positive health benefits for themselves and their infants, and the tangible experience of improved well being, women can ignore or overcome transitory side effects and are often willing to purchase iron tablets on their own. Contrary to the belief that women stop taking iron tablets mainly due to side effects, in these studies only about one-third of women reported that they experienced side effects, and only about one-tenth of women stopped taking iron tablets because of side effects during iron supplementation trials. Others corroborate this in the literature (Charoenlarp et al. 1988; IMCR 1989; Bexel 1990; Massawe et al. 1995).

To increase women's awareness of anemia and demand for iron supplements during pregnancy, training must expand health service providers' own knowledge and appreciation of the importance of anemia prevention and control efforts, with specific attention to iron supplementation during this period in a woman's life. In addition, providers must be trained to effectively counsel women about anemia and iron supplementation during pregnancy. The use of counseling cards, posters and other media, based on findings from formative research can reinforce messages if health workers are trained to use them. Women require accurate information about their need for iron supplements to meet the physiological demands for iron during pregnancy. They need counseling to help them manage side effects that sometimes occur when taking iron supplements, support for consistent adherence to the daily regimen throughout pregnancy, and advice on changing basic dietary practices (e.g., avoid tea and coffee consumption with meals and iron tablets) to enhance bioavailability of the iron.

In addition to lack of awareness and low demand, poor utilization of antenatal care services is another major reason that women are not consuming iron tablets. Inadequate and sporadic supplies of iron tablets, as well as the failure to distribute them (or to distribute them in large enough – 90 or 100 tablets – amounts) also emerge as barriers. Similar problems concerning adequate supplies have been recorded in Thailand (Gillespie et al. 1991); in Indonesia (DHS 1995); in India (IMRC, 1989); in Somalia (Gove et al. 1987 as reported in WHO 1990); and in Tanzania (Massawe et al. 1995). The frequently poor quality of antenatal care, particularly deficient counseling and failure

to distribute iron supplements in adequate amounts, impede women's ability to consume the recommended number of iron tablets during pregnancy.

In several countries (Indonesia, Malawi, Bolivia, Guatemala, Honduras), respondents are willing to try community-based distribution schemes for iron tablets (community health workers such as TBAs or health promoters, or through the private sector using small retail shops) to increase accessibility if the distributor is supervised by the public health system. Using home visits and community sources to increase the number of iron supplements women are receiving and consuming has been tried in various settings with some success (Palgi et al. 1981; Gofin et al. 1989; Gove et al. 1987 as reported in WHO 1990; Seshardri et al. 1993; Menendez et al. 1994).

Two MotherCare-supported studies (Utomo et al. 1993; Robinson 1998) followed the formative research in West Java, Indonesia, to examine the impact of an alternative community-based iron supplement distribution system staffed by TBAs. In West Java, community-based distribution of iron using TBAs was acceptable to women and their intake of iron tablets increased nearly three-fold (from 24 tablets to 62 tablets during pregnancy) with 92% of all women taking at least some iron tablets. The most recent study (Robinson 1998) in Maluku demonstrates increased adherence to a daily iron supplement regimen (70% with TBAs vs. 47% in the control area). Women's average additional intake of iron over 20 weeks amounted to 1800 mg of elemental iron (95 tablets compared to 65 tablets) with a net 6.5 g/L rise in hemoglobin level for women in the TBA-distribution area versus a 6.5 g/L decrease for the control women.

In addition to pursuing innovative community-based distribution strategies, procurement of adequate stocks of iron folate supplements for the estimated number of pregnant women⁷ is fundamental to program success. As these results document, the tablets should be of the highest quality allowed by the program budget, since color, size, coating, and packaging of iron tablets may affect consumption.

The formative research identified a number of specific cultural beliefs that act as barriers to iron supplement consumption. Concerns about increased birthweight and a difficult delivery were expressed in Bolivia, Burkina Faso, Honduras, India, and Indonesia. Similar findings have also been documented in earlier research (Nichter & Nichter 1983; Bexell 1990). Some women in Bolivia are concerned that taking “medicine” during pregnancy will harm their unborn baby. In Malawi and India, some women worry that taking iron tablets for “increased blood” will ultimately cause them to lose more blood during delivery due to the excess that has developed with increased iron intake. To counteract this possibility, women save the iron tablets for consumption after delivery. While increased appetite may be seen as a benefit of improved iron status where pregnant women consume less than recommended amounts of energy, women often fear an improved appetite due to their economic inability to increase food intake (Honduras, Malawi). The signs and symptoms of anemia are perceived to be normal conditions of pregnancy (India, Indonesia) and other researchers document a complacency about taking tablets as the pregnancy nears its end. Unpublished data from Peru suggest that women become more irregular in taking their iron tablets as the time to deliver approaches (Caulfield, personal communication, 1998). Development of

communications materials and strategies need to take account of these beliefs in the design of messages, and health service providers must be trained to counsel and deliver services within the cultural context of their target populations.

Conclusions

Formative research is a useful tool for designing and refining iron supplementation program strategies and messages for communication materials. The results reported here help to identify specific barriers to program impact on maternal anemia in eight developing countries. These barriers include lack of knowledge and awareness of anemia and its consequences among health service providers, women, and their families, as well as problematic iron supplement supply and distribution systems. Misconceptions about negative physiological impacts of iron supplements (e.g., causing hypertensive disease) and other cultural beliefs can exert significant influence on whether or not women take iron. Difficult access and infrequent and late pregnancy utilization of health services also serve to impede successful receipt and consumption of iron supplements. In addition to barriers, formative research reveals knowledge, beliefs, and practices that serve to improve and support optimal consumption of iron supplements. The iron supplement trials identified that side effects are not a problem for most women. Among women who are experiencing them, most are willing to tolerate transitory side effects. We propose that iron supplementation programs will not improve until the problems of supplies and distribution (including ineffective provider support for supplement consumption) are addressed. Demand is also a problem since asking women to adhere to a daily regimen of supplement consumption over an extended period of time

is a complex behavioral task. Research is needed in the context of programs to determine innovative ways to solve supply and distribution problems and to ensure adherence to a daily regimen over the course of pregnancy. These problems pertain not only to iron but also to any supplement that must be given at regular intervals.

¹ Iron supplements usually contain 60 mg of elemental iron. Prenatal vitamins typically contain 30 mg or less of elemental iron.

² We have used compliance/non-compliance and adherence/non-adherence as terms of convenience, acknowledging that the literature on medical compliance documents the inherent value judgments associated with these concepts and associated issues of physician dominance. Typically, non-compliance (or non-adherence) with medical advice is assumed to reflect patient ignorance, inability to retain medical instructions, or willful, deviant behavior. Recent research (Donovan and Blake, 1992) suggests that compliance (or not) with medical advice is the result of rational decision-making by the patient about the costs and benefits of prescribed actions, depending upon individual sociocultural circumstances. Donovan and Blake (1992) suggest that “more open, cooperative doctor-patient relationships” are the key to improved compliance. Finding ways to improve the patient-provider relationship through “negotiation and accommodation” must be found (Lerner, 1997).

³ The MotherCare Project is a United States Agency for International Development (USAID)-funded maternal and child health project implemented by John Snow, Inc., and its partners.

⁴ Partners included: Opportunities for Micronutrient Initiatives Project (OMNI) funded by USAID and implemented by John Snow, Inc., Arlington, VA, with OMNI responsible for the qualitative work on anemia in Bolivia, and MotherCare taking the lead for baseline quantitative research on the anemia prevalence situation in selected districts in Bolivia; the University of Indonesia, Jakarta, Indonesia; Rural Unit for Health and Social Affairs (RUHSA), Christian Medical College and Hospital, Vellore, India; MS University of Baroda, Vadodora, India; PATH, Jakarta, Indonesia; Service de Gynecologie et d'Obstetrique, Centre Hospitalier National Souro Sanon, Bobo-Dioulasso, Burkina Faso; The Manoff Group, Washington, D.C.; The Survival for Women and Children Foundation (SWACH), Chandigarh, India; PRODIM, Tegucigalpa, Honduras; St. John's Medical College, Bangalore, India; The London School of Hygiene and Tropical Medicine; The Asia Foundation/Pakistan and collaborating NGOs.

⁵ The TIPS methodology, based on product testing in marketing research, was developed by The Manoff Group to test child-feeding recommendations with mothers, negotiate feeding behavior changes, and evaluate their reactions to the new practices. The Manoff Group adapted this methodology for use with iron supplement trials.

⁶ In Bolivia, weakness is known as *ch'amajiwt'ayasta* in Aymaran and *pullu pullu* describes sleepiness or tiredness in Quechua. Participants in Guatemala used words in

K'iche' and Mam, generally translated as *debilidad* to describe the weakness that women feel during pregnancy. In Burkina Faso, *djoliban* characterized “lacking blood.”

Indonesians used the term *kurang darah* meaning “low blood,” having no energy, and feeling tired. Respondents in Malawi had several words in Chechewa to mean anemia, such as *kusowa magazi* or “lack of blood,” *wochepa magazi* or “little blood,” and *magazi osakwana* or “insufficient blood.” In India, “weakness” is *kamzori* in North Haryana, *kamjori* or *ashakti* in urban Gujarat, and *susthu* in rural Karnataka. In rural Tamil Nadu, *iratham kuraivaga ullathu* means “there is less or little blood.”

⁷ This should include a buffer stock of 25-30% over and above the estimated total number of iron supplements required for a population (Stoltzfus and Dreyfus 1998, Gillespie et al. 1991).